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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,780	05/27/2004	Davis Andrew McClure	5000.238A	3779
21176	7590	04/20/2005	EXAMINER	
SUMMA & ALLAN, P.A. 11610 NORTH COMMUNITY HOUSE ROAD SUITE 200 CHARLOTTE, NC 28277			TRAN, THIEN F	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 04/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/709,780

Applicant(s)

MCCLURE ET AL.

Examiner

Thien F. Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 February 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 26-48 and 60-93 is/are pending in the application.
- 4a) Of the above claim(s) 40-48 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 60-93 is/are allowed.
- 6) ☒ Claim(s) 26-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>10/25/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Applicant's election of species 1 with claims c1-c14 and c24-c57 (also numbered as 26-39 and 60-93 in the application) in the reply filed on 02/03/2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Objections

Claim 29 is objected to because of the following informalities: line 2, "cm⁻²" should be --cm⁻³-- for consistency with claim 67 and claim 93. Appropriate correction is required.

Specification

This application does not contain a brief summary of the invention as required by 37 CFR 1.73.

This application does not contain a brief description of Drawings as required by 37 CFR 1.74.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 33 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not

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described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The disclosure does not provide the ordinary skill artisan with a reasonable expectation of success in creating or carrying out the claimed subject matter, since it does not provide any guidance as to how such a doped region of dopant atoms is formed that comprises nitrogen having the concentration as recited in claim 32 and phosphorus having the concentration as recited in claim 33. Without this disclosure, one of ordinary skill cannot practice the invention without undue experimentation because of the number of operational parameters in the process. Applicant is requested to point out exactly wherein the application that provides support for a doped regions comprising both nitrogen and phosphorus and having the concentrations as claimed.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 26-39 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 26, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 26-29, 32, 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Edmond (USPN 5,027,168).

Edmond discloses the claimed silicon carbide structure (Figure 1) for a light emitting diode 20 comprising a silicon carbide wafer having a first and second surface and having a predetermined conductivity type (n type) and an initial carrier concentration; a doped region 23 of dopant atoms extending from said first surface into said silicon carbide wafer 21 to a predetermined depth, said region having a higher carrier concentration (n+) than said initial carrier concentration (n) in the remainder 21 of said wafer; and an epitaxial layer 24 on said first surface of said silicon carbide wafer.

Regarding claim 27, said silicon carbide wafer comprises n-type 6H-silicon carbide.

Regarding claim 28, said silicon carbide wafer is doped with nitrogen donor atoms.

Regarding claim 29, the concentration of said nitrogen donor atoms is within the claimed range.

Regarding claim 32, the doped region 23 of dopant atoms comprises nitrogen in a concentration of $2 \times 10^{19} \text{ cm}^{-3}$.

Regarding claim 34, said silicon carbide wafer comprises n-type 4H-silicon carbide.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edmond (US 5,027,168) in view of Slater et al. (WO 00/16382).

Edmond as described above discloses the doped region 23 of dopant atoms comprising nitrogen in a concentration of $2 \times 10^{19} \text{ cm}^{-3}$ but does not explicitly disclose the dopant atoms could also be phosphorus. However, nitrogen and phosphorus are materials known in the art and routinely used to form n-type dopants in semiconductor device as shown for example by Slater et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select any one of these materials as a suitable n-type dopant material for the dopant atoms in the doped region 23 of Edmond, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of design choice. In re Leshin, 125 USPQ 416.

Claims 35-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edmond (US 5,027,168).

Edmond as described above discloses the doped region 23 having the concentration of about $2 \times 10^{19} \text{ cm}^{-3}$ but does not disclose the doped region having a thickness (depth) of about 800 to 1000 angstroms. It would have been an obvious to select the thickness of the doped region depending on the desired characteristics and

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design of the diodes. Also, thickness of the doped region in semiconductor devices is variable of importance subject to routine experimentation and optimization. Accordingly, it would be well for one within ordinary skill in the art to select the thickness of the doped region 23 as claimed.

Allowable Subject Matter

Claims 60-93 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: prior art references do not teach or render obvious a light emitting diode having the structure arrangement as recited in claim 60.

Prior art references do not teach or render obvious a light emitting diode having the structure arrangement as recited in claim 79.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien F. Tran whose telephone number is (571) 272-1665. The examiner can normally be reached on 8:30AM - 5:00PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

tt
April 12, 2005


THIENTRAN
PRIMARY EXAMINER